

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Original): A plasma processing method comprising the steps of:
preparing a process subject having an organic layer on a surface thereof; and
irradiating the process subject with H₂ plasma to improve plasma resistance of the organic layer.

Claim 2 (Original): The plasma processing method according to claim 1, wherein the organic layer is a mask layer.

Claim 3 (Original): The plasma processing method according to claim 2, wherein the mask layer is a photoresist layer.

Claim 4 (Original): The plasma processing method according to claim 3, wherein the photoresist layer is made of an ArF photoresist or F2 photoresist.

Claim 5 (Original): A plasma processing method comprising the steps of:
preparing a process subject having an organic layer on a surface thereof; and
irradiating the process subject with plasma of a process gas containing H₂ and an inert gas, to improve plasma resistance of the organic layer.

Claim 6 (Original): The plasma processing method according to claim 5, wherein the organic layer is a mask layer.

Claim 7 (Original): The plasma processing method according to claim 6, wherein the mask layer is a photoresist layer.

Claim 8 (Original): The plasma processing method according to claim 7, wherein the photoresist layer is made of an ArF photoresist or F2 photoresist.

Claim 9 (Original): The plasma processing method according to claim 5, wherein the process gas contains N₂.

Claim 10 (Original): A plasma processing method comprising the steps of:

preparing a process subject having an organic layer on a surface thereof; and
irradiating the process subject with plasma of a process gas containing a substance having H and an inert gas, to improve plasma resistance of the organic layer.

Claim 11 (Original): The plasma processing method according to claim 10, wherein the organic layer is a mask layer.

Claim 12 (Original): The plasma processing method according to claim 11, wherein the mask layer is a photoresist layer.

Claim 13 (Original): The plasma processing method according to claim 10, wherein the substance having H is NH_3 .

Claim 14 (Original): The plasma processing method according to claim 10, wherein the process gas contains N_2 .

Claim 15 (Original): A plasma processing method comprising the steps of:
preparing a process subject having a photoresist layer made of an ArF photoresist or F2 photoresist on a surface thereof; and

irradiating the process subject with plasma of a process gas containing a substance having H, to improve plasma resistance of the photoresist layer.

Claim 16 (Original): The plasma processing method according to claim 15, wherein the substance having H is H_2 .

Claim 17 (Original): The plasma processing method according to claim 15, wherein the substance having H is NH_3 .

Claim 18 (Original): The plasma processing method according to claim 15, wherein the process gas contains N_2 .

Claim 19 (Original): The plasma processing method according to claim 15, wherein the step of irradiation with plasma is performed in an atmosphere having a pressure of 13.3 Pa (100 mTorr) or less.

Claim 20 (Original): The plasma processing method according to claim 19, wherein the step of irradiation with plasma is performed in an atmosphere having a pressure of 1.1 to 4.0 Pa (8 to 30 mTorr).

Claim 21 (Original): The plasma processing method according to claim 19, wherein the process subject has an etching objective layer below the photoresist layer, the photoresist has an opening pattern, and the method comprises a step of plasma-etching the etching objective layer through the opening pattern of the photoresist layer after the plasma irradiation.

Claim 22 (Original): A plasma processing method comprising the steps of:
placing a process subject in a process container, wherein the process subject has an etching objective portion, and an organic layer covering the etching objective portion and having an opening pattern formed therein;

turning a process gas containing a substance having H into plasma in the process container, and irradiating the organic layer with the plasma; and

turning an etching gas into plasma in the process container, and etching the etching objective portion through the opening pattern.

Claim 23 (Original): The plasma processing method according to claim 22, wherein the substance having H is H_2 .

Claim 24 (Original): The plasma processing method according to claim 22, wherein the substance having H is NH_3 .

Claim 25 (Original): The plasma processing method according to claim 22, wherein the process gas contains N_2 .

Claim 26 (Original): The plasma processing method according to claim 22, wherein the organic layer is a mask layer.

Claim 27 (Original): The plasma processing method according to claim 26, wherein the mask layer is a photoresist layer.

Claim 28 (Original): The plasma processing method according to claim 27, wherein the photoresist layer is made of an ArF photoresist or F2 photoresist.

Claim 29 (Original): The plasma processing method according to claim 22, wherein the process gas and the etching gas are the same gas.

Claim 30 (Original): The plasma processing method according to claim 22, wherein the etching gas is a gas formed of the process gas and another gas added thereto.

Claim 31 (Original): The plasma processing method according to claim 22, wherein the etching objective portion is an SiO₂ layer.

Claim 32 (Original): The plasma processing method according to claim 31, wherein the etching gas is a gas containing C₅F₈.

Claim 33 (Currently Amended): The plasma processing method according to claim 22 23, wherein the step of irradiation with plasma is performed in an atmosphere having a pressure of 13.3 Pa (100 mTorr) or less.

Claim 34 (Original): The plasma processing method according to claim 33, wherein the step of irradiation with plasma is performed in an atmosphere having a pressure of 1.1 to 4.0 Pa (8 to 30 mTorr).

Claim 35 (Original): A plasma processing method comprising the steps of:
preparing a process subject having a photoresist layer made of an ArF photoresist or F2 photoresist on a surface thereof; and
irradiating the process subject with plasma of a process gas containing a substance having N, to improve plasma resistance of the photoresist layer.

Claim 36 (Original): The plasma processing method according to claim 35, wherein the substance having N is N₂.

Claim 37 (Original): The plasma processing method according to claim 35, wherein the substance having N is NH_3 .

Claim 38 (Original): The plasma processing method according to claim 35, wherein the process gas contains a substance having H.

Claim 39 (Original): The plasma processing method according to claim 38, wherein the substance having H is one or more selected from the group consisting of H_2 , CHF_3 , CH_2F_2 , and CH_3F .

Claim 40 (Original): A plasma processing method comprising the steps of:
placing a process subject in a process container, wherein the process subject has an etching objective portion, an antireflective layer covering the etching objective portion, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the antireflective layer, and having an opening pattern formed therein;

supplying a process gas into the process container;

turning the process gas into plasma; and

causing the plasma to act on the process subject to improve plasma resistance of the photoresist layer, and to etch the antireflective layer through the opening pattern.

Claim 41 (Original): The plasma processing method according to claim 40, wherein the process gas contains H_2 .

Claim 42 (Original): The plasma processing method according to claim 41, wherein the process subject is placed on a susceptor disposed in the process container, and, in the step of causing the plasma to act on the process subject, the susceptor is supplied with a high-frequency power having a frequency of 100 MHz or more, and a high-frequency power having a frequency of 3 MHz or more.

Claim 43 (Original): The plasma processing method according to claim 42, wherein the high-frequency power having a frequency of 3 MHz or more is set at 100W or less.

Claim 44 (Original): The plasma processing method according to claim 41, wherein the process gas is H₂.

Claim 45 (Original): A plasma processing method comprising the steps of:
placing a process subject in a process container, wherein the process subject has an etching objective layer, an antireflective layer covering the etching objective layer, and a mask layer covering the antireflective layer and having an opening pattern formed therein;
supplying a process gas containing H₂ into the process container;
turning the process gas into plasma; and
selectively etching the antireflective layer relative to the mask layer by the plasma, through the opening pattern of the mask layer.

Claim 46 (Original): The plasma processing method according to claim 45, wherein the process subject is placed on a susceptor disposed in the process container, and, in the etching step, the susceptor is supplied with a high-frequency power having a frequency of 100 MHz or more, and a high-frequency power having a frequency of 3 MHz or more, in a superimposition manner.

Claim 47 (Original): The plasma processing method according to claim 46, wherein the high-frequency power having a frequency of 3 MHz or more is set at 100W or less.

Claim 48 (Original): The plasma processing method according to claim 45, wherein the mask layer is an ArF photoresist layer or F2 photoresist layer.

Claim 49 (Original): The plasma processing method according to claim 45, wherein the process gas is H₂.

Claim 50 (Original): The plasma processing method according to claim 49, further comprising, after the step of etching the antireflective layer, a step of turning CF₄ and H₂ into plasma, and etching halfway the etching objective layer through the opening pattern of the

mask layer, and a step of turning an etching gas into plasma, and etching a remaining portion of the etching objective layer, following the step of etching halfway.

Claim 51 (Original): The plasma processing method according to claim 50, wherein the mask layer is an ArF photoresist layer or F2 photoresist layer.

Claim 52 (Original): The plasma processing method according to claim 50, wherein the mask layer is made of a methacrylate resin.

Claim 53 (Original): The plasma processing method according to claim 50, wherein the etching gas is a gas other than a mixture gas of CF_4 and H_2 .

Claim 54 (Original): The plasma processing method according to claim 50, wherein the etching objective layer is an SiO_2 layer, and the etching gas is a gas containing C_5F_8 and O_2 .

Claim 55 (Original): A plasma processing method comprising:

a step of placing a process subject on a worktable, wherein the process subject has an etching objective layer, and a mask layer made of an ArF photoresist or F2 photoresist, covering the etching objective layer, and having an opening pattern formed therein;

an initial etching step of turning CF_4 and H_2 into plasma, and etching halfway the etching objective layer through the opening pattern of the mask layer; and

a main etching step of turning an etching gas containing a fluorocarbon into plasma, and etching the etching objective layer, following the initial etching step.

Claim 56 (Original): The plasma processing method according to claim 55, wherein the etching objective layer is an SiO_2 layer.

Claim 57 (Original): A plasma processing method comprising:

a step of placing a process subject on a worktable, wherein the process subject has an etching objective layer, an antireflective layer covering the etching objective layer, and a

mask layer made of an acrylate resin, covering the antireflective layer, and having an opening pattern formed therein;

a first etching step of turning CF_4 into plasma, and etching the antireflective layer through the opening pattern of the mask layer;

a second etching step of turning CF_4 and H_2 into plasma, and etching halfway the etching objective layer through the opening pattern of the mask layer; and

a third etching step of turning an etching gas containing a fluorocarbon into plasma, and etching the etching objective layer, following the second etching step.

Claim 58 (Original): The plasma processing method according to claim 57, wherein the etching objective layer is an SiO_2 layer.

Claim 59 (Original): A plasma processing method comprising the steps of:
placing a process subject on a susceptor disposed in a process container, wherein the process subject has an etching objective layer, and a mask layer covering the etching objective layer and having an opening pattern formed therein;

supplying a process gas containing H_2 into the process container;

supplying the susceptor with a high-frequency power having a frequency of 100 MHz or more, and a high-frequency power having a frequency of 3 MHz or more; and

setting a pressure in the process container at 13.3 Pa (100 mTorr) or less.

Claim 60 (Original): The plasma processing method according to claim 59, wherein the high-frequency power having a frequency of 3 MHz or more is set at 100W or less.

Claim 61 (Original): A plasma processing method comprising the steps of:
placing a process subject in a process container, wherein the process subject has an etching objective portion, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the etching objective portion, and having an opening pattern formed therein;

turning a process gas containing a substance having N into plasma in the process container, and irradiating the photoresist layer with the plasma; and

turning an etching gas into plasma in the process container, and etching the etching objective portion through the opening pattern.

Claim 62 (Original): The plasma processing method according to claim 61, wherein the substance having N is N_2 .

Claim 63 (Original): The plasma processing method according to claim 62, wherein the process gas contains H_2 .

Claim 64 (Original): The plasma processing method according to claim 62, wherein the process gas contains one or more selected from the group consisting of CHF_3 , CH_2F_2 , and CH_3F .

Claim 65 (Original): The plasma processing method according to claim 61, wherein the substance having N is NH_3 .

Claim 66 (Original): A plasma processing method comprising:

a step of placing a process subject in a process container, wherein the process subject has an etching objective portion, an antireflective layer covering the etching objective portion, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the antireflective layer, and having an opening pattern formed therein;

a first etching step of turning a process gas containing a substance having N into plasma in the process container, and etching the antireflective layer through the opening pattern; and

a second etching step of turning an etching gas into plasma in the process container, and etching the etching objective portion through the opening pattern.

Claim 67 (Original): The plasma processing method according to claim 66, wherein the substance having N is N_2 .

Claim 68 (Original): The plasma processing method according to claim 67, wherein the process gas contains H₂.

Claim 69 (Original): The plasma processing method according to claim 68, wherein the first etching step is performed with a pressure in the process container set at 107 to 160 Pa (800 to 1,200 mTorr).

Claim 70 (Original): The plasma processing method according to claim 69, wherein the etching objective layer is an SiO₂ layer, and the etching gas contains C₅F₈.

Claim 71 (Original): The plasma processing method according to claim 70, wherein the C₅F₈ is 1,1,1,4,4,5,5,5-octafluoro-2-pentyne.

Claim 72 (Original): The plasma processing method according to claim 67, wherein the process gas contains one or more selected from the group consisting of CHF₃, CH₂F₂, and CH₃F.

Claim 73 (Original): The plasma processing method according to claim 66, wherein the substance having N is NH₃.

Claim 74 (Original): The plasma processing method according to claim 66, wherein the etching objective layer is an SiO₂ layer, and the etching gas contains C₄F₆.

Claim 75 (Original): The plasma processing method according to claim 66, wherein the etching objective layer is an SiO₂ layer, and the etching gas contains C₅F₈.

Claim 76 (Original): The plasma processing method according to claim 75, wherein the C₅F₈ is a straight-chain C₅F₈.

Claim 77 (Original): The plasma processing method according to claim 76, wherein the straight-chain C₅F₈ is 1,1,1,4,4,5,5,5-octafluoro-2-pentyne.

Claim 78 (Original): The plasma processing method according to claim 75, wherein the process gas contains N₂ and H₂, and the first etching step is performed with a pressure in the process container set at 107 to 160 Pa (800 to 1,200 mTorr).

Claim 79 (Original): A plasma processing method comprising the steps of:

placing a process subject in a process container, wherein the process subject has an etching objective layer, and an organic mask layer covering the etching objective layer and having an opening pattern formed therein, and the process container includes a component with an exposed portion made of a substance having Si;

supplying a process gas of one or more selected from the group consisting of H₂, N₂, and He into the process container; and

turning the process gas into plasma, and plasma-processing the organic mask layer.

Claim 80 (Original): The plasma processing method according to claim 79, further comprising a step of etching the etching objective layer after the plasma process step.

Claim 81 (Original): The plasma processing method according to claim 79, wherein the organic mask layer is an organic photoresist layer.

Claim 82 (Original): The plasma processing method according to claim 81, wherein the organic photoresist layer is made of an ArF photoresist or F2 photoresist.

Claim 83 (Original): The plasma processing method according to claim 79, wherein the substance having Si is single-crystalline Si.

Claim 84 (Original): The plasma processing method according to claim 79, wherein the substance having Si is SiC.

Claim 85 (Original): The plasma processing method according to claim 79, wherein the component with an exposed portion made of a substance having Si is a counter electrode disposed in the process container to face the process subject.

Claim 86 (Original): A plasma processing method comprising the steps of:

placing a process subject in a process container, wherein the process subject has an etching objective layer, an organic film covering the etching objective layer, and an organic mask layer covering the organic film and having an opening pattern formed therein, and the

process container includes a component with an exposed portion made of a substance having Si;

supplying an etching gas into the process container;

turning the etching gas into plasma, and etching the organic film through the opening pattern of the organic mask layer;

supplying a process gas of one or more selected from the group consisting of H₂, N₂, and He into the process container; and

turning the process gas into plasma, and plasma-processing the organic mask layer.

Claim 87 (Original): The plasma processing method according to claim 86, wherein the etching gas contains CF₄.

Claim 88 (Original): The plasma processing method according to claim 86, further comprising a step of etching the etching objective layer after the plasma process step.

Claim 89 (Original): The plasma processing method according to claim 86, wherein the organic film is an organic antireflective film.

Claim 90 (Original): The plasma processing method according to claim 86, wherein the organic mask layer is an organic photoresist layer.

Claim 91 (Original): The plasma processing method according to claim 90, wherein the organic photoresist layer is made of an ArF photoresist or F2 photoresist.

Claim 92 (Original): The plasma processing method according to claim 86, wherein the substance having Si is single-crystalline Si.

Claim 93 (Original): The plasma processing method according to claim 86, wherein the substance having Si is SiC.

Claim 94 (Original): The plasma processing method according to claim 86, wherein the component with an exposed portion made of a substance having Si is a counter electrode disposed in the process container to face the process subject.

Claim 95 (Original): A plasma processing method comprising the steps of:

placing a process subject in a process container, wherein the process subject has an etching objective layer, an organic film covering the etching objective layer, and an organic mask layer covering the organic film and having an opening pattern formed therein, and the process container includes a component with an exposed portion made of a substance having Si;

supplying H₂ into the process container; and

turning the supplied H₂ into plasma, and etching the organic film through the opening pattern of the organic mask layer.

Claim 96 (Original): The plasma processing method according to claim 95, further comprising a step of etching the etching objective layer after the step of etching the organic film.

Claim 97 (Original): The plasma processing method according to claim 95, wherein the organic film is an organic antireflective film.

Claim 98 (Original): The plasma processing method according to claim 95, wherein the organic mask layer is an organic photoresist layer.

Claim 99 (Original): The plasma processing method according to claim 98, wherein the organic photoresist layer is made of an ArF photoresist or F2 photoresist.

Claim 100 (Original): The plasma processing method according to claim 95, wherein the substance having Si is single-crystalline Si.

Claim 101 (Original): The plasma processing method according to claim 95, wherein the substance having Si is SiC.

Claim 102 (Original): The plasma processing method according to claim 95, wherein the component with an exposed portion made of a substance having Si is a counter electrode disposed in the process container to face the process subject.

Claim 103 (Original): A plasma processing method comprising the steps of:

placing a process subject in a process container, wherein the process subject has an etching objective layer, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the etching objective layer, and having an opening pattern formed therein;

supplying a process gas containing C_2F_4 into the process container accommodating the process subject;

turning the process gas into plasma; and

etching the etching objective layer on the process subject by the plasma of the process gas through the opening pattern of the photoresist layer.

Claim 104 (Original): The plasma processing method according to claim 103, wherein the etching objective layer is a carbon-containing layer.

Claim 105 (Original): The plasma processing method according to claim 103, wherein the etching objective layer is an organic layer.

Claim 106 (Original): A plasma processing method comprising the steps of:

placing a process subject in a process container, wherein the process subject has an etching objective layer, and a mask layer covering the etching objective layer and having an opening pattern formed therein;

supplying a process gas containing C_2F_4 and O_2 into the process container accommodating the process subject;

turning the process gas into plasma; and

etching the etching objective layer on the process subject by the plasma of the process gas through the opening pattern of the mask layer.

Claim 107 (Original): The plasma processing method according to claim 106, wherein the mask layer is a photoresist layer.

Claim 108 (Original): The plasma processing method according to claim 107, wherein the etching objective layer is an antireflective layer.

Claim 109 (Original): The plasma processing method according to claim 107, wherein the photoresist layer is made of an ArF photoresist or F2 photoresist.

Claim 110 (Original): The plasma processing method according to claim 106, wherein the etching objective layer is a carbon-containing layer.

Claim 111 (Original): The plasma processing method according to claim 106, wherein the etching objective layer is an organic layer.

Claim 112 (Original): A plasma processing method comprising the steps of:
placing a process subject in a process container, wherein the process subject has an etching objective portion, an antireflective layer covering the etching objective portion, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the antireflective layer, and having an opening pattern formed therein;

turning an etching gas containing a substance having C and F and a substance having H into plasma in the process container, and etching the antireflective layer through the opening pattern; and

etching the etching objective portion.

Claim 113 (Original): The plasma processing method according to claim 112, wherein the substance having H is a hydrocarbon.

Claim 114 (Original): The plasma processing method according to claim 113, wherein the hydrocarbon is CH₄.

Claim 115 (Original): The plasma processing method according to claim 112, wherein the substance having H is H₂.

Claim 116 (Original): The plasma processing method according to claim 112, wherein the substance having H is a hydrofluorocarbon.

Claim 117 (Original): The plasma processing method according to claim 116, wherein the number of H atoms relative to the number of F atoms is three or more in the hydrofluorocarbon.

Claim 118 (Original): The plasma processing method according to claim 117, wherein the hydrofluorocarbon is CH₃F.

Claim 119 (Original): The plasma processing method according to claim 118, wherein a ratio of a flow rate of the CH₃F relative to a flow rate of the substance having C and F is set at 0.04 to 0.07 in the etching gas.

Claim 120 (Original): The plasma processing method according to claim 112, wherein the substance having C and F is CF₄.

Claim 121 (Original): A plasma processing method comprising the steps of:
placing a process subject in a process container, wherein the process subject has an etching objective portion, an antireflective layer covering the etching objective portion, and a mask layer covering the antireflective layer and having an opening pattern formed therein;
turning an etching gas containing a substance having C and F, and a hydrocarbon into plasma in the process container, and etching the antireflective layer through the opening pattern; and
etching the etching objective portion.

Claim 122 (Original): The plasma processing method according to claim 121, wherein the hydrocarbon is CH₄.

Claim 123 (Original): The plasma processing method according to claim 121, wherein the substance having C and F is CF₄.

Claim 124 (Original): The plasma processing method according to claim 121, wherein the mask layer is an ArF photoresist layer or F2 photoresist layer.

Claim 125 (Original): A plasma processing method comprising the steps of:

placing a process subject in a process container, wherein the process subject has an etching objective portion, an antireflective layer covering the etching objective portion, and a mask layer covering the antireflective layer and having an opening pattern formed therein;

turning an etching gas into plasma in the process container, and etching the antireflective layer through the opening pattern, wherein the etching gas contains a substance having C and F, and a substance having C, H, and F in which the number of H atoms relative to the number of F atoms is three or more; and

etching the etching objective portion.

Claim 126 (Original): The plasma processing method according to claim 125, wherein the substance having C, H, and F in which the number of H atoms relative to the number of F atoms is three or more is CH_3F .

Claim 127 (Original): The plasma processing method according to claim 125, wherein the substance having C and F is CF_4 .

Claim 128 (Original): The plasma processing method according to claim 127, wherein a ratio of a flow rate of the CH_3F relative to a flow rate of the substance having C and F is set at 0.04 to 0.07 in the etching gas.

Claim 129 (Original): The plasma processing method according to claim 125, wherein the mask layer is an ArF photoresist layer or F2 photoresist layer.

Claim 130 (Original): A plasma processing method comprising the steps of:
placing a process subject in a process container, wherein the process subject has an etching objective portion, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the etching objective portion, and having an opening pattern formed therein;

turning a process gas containing a substance having C and F, and CO into plasma in the process container, and irradiating the photoresist layer with the plasma; and

turning an etching gas into plasma in the process container, and etching the etching objective portion by the plasma of the etching gas through the opening pattern.

Claim 131 (Original): The plasma processing method according to claim 130, wherein the substance having C and F is CF_4 .

Claim 132 (Original): The plasma processing method according to claim 130, wherein the process gas and the etching gas are the same gas.

Claim 133 (Original): The plasma processing method according to claim 132, wherein the etching objective portion is an antireflective layer.

Claim 134 (Original): A plasma processing method comprising:
a step of placing a process subject in a process container, wherein the process subject has an etching objective portion, an antireflective layer covering the etching objective portion, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the antireflective layer, and having an opening pattern formed therein;

a first etching step of turning a first etching gas containing a substance having C and F, and CO into plasma in the process container, and etching the antireflective layer by the plasma through the opening pattern; and

a second etching step of turning a second etching gas into plasma in the process container, and etching the etching objective portion by the plasma of the second etching gas through the opening pattern.

Claim 135 (Original): The plasma processing method according to claim 134, wherein the substance having C and F is CF_4 .

Claim 136 (Original): The plasma processing method according to claim 134, wherein the etching objective portion is an SiO_2 layer, and the second etching gas contains C_5F_8 .

Claim 137 (Original): The plasma processing method according to claim 134, wherein the etching objective portion is an SiO₂ layer, and the second etching gas contains C₄F₆.

Claim 138 (Original): A plasma processing method comprising:
a step of placing a process subject in a process container, wherein the process subject has an etching objective portion, an antireflective layer covering the etching objective portion, and a mask layer covering the antireflective layer and having an opening pattern formed therein;
a first etching step of turning a first etching gas containing CF₄ and CO into plasma in the process container, and etching the antireflective layer by the plasma through the opening pattern; and
a second etching step of turning a second etching gas into plasma in the process container, and etching the etching objective portion by the plasma of the second etching gas through the opening pattern.

Claim 139 (Original): The plasma processing method according to claim 138, wherein the etching objective portion is an SiO₂ layer, and the second etching gas contains C₄F₆.

Claim 140 (Original): The plasma processing method according to claim 139, wherein the etching objective portion is an SiO₂ layer, and the second etching gas contains C₅F₈.

Claim 141 (Original): A plasma processing method comprising the steps of:
placing a process subject in a process container, wherein the process subject has an etching objective layer, an organic antireflective layer covering the etching objective layer, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the organic antireflective layer, and having an opening pattern formed therein;

supplying an etching gas containing a substance having Si into the process container;
and

turning the etching gas into plasma, and etching the organic antireflective layer through the opening pattern of the photoresist layer.

Claim 142 (Original): The plasma processing method according to claim 141, wherein the substance having Si is SiF₄.

Claim 143 (Original): The plasma processing method according to claim 142, wherein the etching gas contains CHF₃.

Claim 144 (Original): The plasma processing method according to claim 142, wherein the etching gas contains HBr.

Claim 145 (Original): The plasma processing method according to claim 142, wherein the etching gas contains He.

Claim 146 (Original): The plasma processing method according to claim 142, wherein the etching gas contains H₂.

Claim 147 (Original): The plasma processing method according to claim 141, further comprising a step of plasma-etching the etching objective layer through the opening pattern of the photoresist layer after the step of etching the organic antireflective layer.

Claim 148 (Original): A plasma processing method comprising the steps of:
placing a process subject on a susceptor disposed in a process container, wherein the process subject has an etching objective layer, and a mask layer covering the etching objective layer and having an opening pattern formed therein;

supplying an inert gas into the process container in a state where the process subject and a member having a surface at least a part of which is made of Si are present in the process container;

supplying the process container with high-frequency energy to ionize at least a part of the inert gas;

supplying an etching gas into the process container;

turning the etching gas into plasma; and

etching the etching objective layer by the plasma of the etching gas through the opening pattern of the mask layer in the process container.

Claim 149 (Original): The plasma processing method according to claim 148, wherein the mask layer is an ArF photoresist layer or F2 photoresist layer.

Claim 150 (Original): The plasma processing method according to claim 148, wherein the member having a surface at least a part of which is made of Si is a focus ring disposed around the process subject.

Claim 151 (Original): The plasma processing method according to claim 148, wherein the member having a surface at least a part of which is made of Si is a showerhead disposed to supply the etching gas into the process container.

Claim 152 (Original): The plasma processing method according to claim 148, wherein the etching objective layer consists of Si oxide, and the etching gas contains at least one selected from the group consisting of C₄F₆, C₄F₈, and C₅F₈.

Claim 153 (Original): The plasma processing method according to claim 148, further comprising a step of plasma-removing the mask layer by a plurality of stages, after the etching step.

Claim 154 (Original): The plasma processing method according to claim 153, wherein the step of plasma-removing the mask layer by a plurality of stages comprises a first removing step of removing a part of the mask layer by plasma of a gas containing a fluorine compound, and a second removing step of removing at least a part of the mask layer left by the first removing step, by plasma of a gas containing no fluorine compound.

Claim 155 (Original): The plasma processing method according to claim 154, wherein the mask layer is an ArF photoresist layer, and the gas used in the first removing step is CF₄.

Claim 156 (Original): The plasma processing method according to claim 148, wherein the step of supplying the process container with energy comprises application of a high-frequency power to an antenna disposed outside the process container.

Claim 157 (Original): The plasma processing method according to claim 148, wherein the step of supplying the process container with energy comprises application of a high-frequency power to a counter electrode disposed in the process container to face the susceptor.

Claim 158 (Original): A plasma processing method comprising the steps of:
placing a process subject on a susceptor disposed in a process container, wherein the process subject has an etching objective layer, and a mask layer covering the etching objective layer and having an opening pattern formed therein;

forming a Si-containing layer on a surface of the mask layer in the process container;
supplying an etching gas into the process container;
turning the etching gas into plasma; and
etching the etching objective layer by the plasma of the etching gas through the opening pattern of the mask layer in the process container.

Claim 159 (Original): The plasma processing method according to claim 158, further comprising a step of plasma-removing the mask layer by a plurality of stages, after the plasma etching step.

Claim 160 (Original): The plasma processing method according to claim 159, wherein the step of plasma-removing the mask layer by a plurality of stages comprises a first removing step of removing a part of the mask layer by plasma of a gas containing a fluorine

compound, and a second removing step of removing at least a part of the mask layer left by the first removing step, by plasma of a gas containing no fluorine compound.

Claim 161 (Original): The plasma processing method according to claim 160, wherein the mask layer is an ArF photoresist layer or F2 photoresist layer, and the gas used in the first removing step is CF_4 .

Claim 162 (Original): The plasma processing method according to claim 158, wherein the mask layer is an ArF photoresist layer or F2 photoresist layer.

Claim 163 (Original): The plasma processing method according to claim 158, wherein the etching objective layer consists of Si oxide, and the etching gas contains at least one selected from the group consisting of C_4F_6 , C_4F_8 , and C_5F_8 .

Claim 164 (Original): The plasma processing method according to claim 158, wherein the step of forming an Si-containing layer is performed by a PVD method.

Claim 165 (Original): The plasma processing method according to claim 158, wherein the step of forming an Si-containing layer is performed by a CVD method.

Claim 166 (Original): A plasma processing method comprising the steps of:
preparing a process container such that a member having a surface at least a part of which is made of Si, a first electrode, and a second electrode facing the first electrode are disposed in the process container;

placing a process subject on the first electrode disposed in the process container, wherein the process subject has an etching objective layer, and a mask layer covering the etching objective layer and having an opening pattern formed therein;

supplying an inert gas into the process container;

applying a high-frequency power to the first electrode;

applying a high-frequency power to the second electrode;

supplying an etching gas into the process container; and

etching the etching objective layer by the etching gas turned into plasma by the high-frequency powers through the opening pattern of the mask layer in the process container.

Claim 167 (Original): The plasma processing method according to claim 166, wherein member having a surface at least a part of which is made of Si is an electrode plate of the second electrode.

Claim 168 (Original): The plasma processing method according to claim 166, further comprising a step of plasma-removing the mask layer by a plurality of stages after the plasma etching step.

Claim 169 (Original): A plasma processing method comprising the steps of:
placing a process subject on a susceptor disposed in a process container, wherein the process subject has an etching objective layer, and a photoresist layer made of an ArF photoresist or F2 photoresist, covering the etching objective layer, and having an opening pattern formed therein;

supplying an etching gas containing an Si compound into the process container;

turning the etching gas into plasma; and

etching the etching objective layer by the plasma of the etching gas through the opening pattern of the photoresist layer in the process container.

Claim 170 (Original): The plasma processing method according to claim 169, wherein the Si compound is SiF₄.

IN THE DRAWINGS

The attached sheet of drawings includes changes to Fig. 14A. This sheet, which includes Fig. 14A, replaces the original sheet including Fig. 14A.

Attachment: 6 Replacement Sheets